

IN THE UNITED STATES DISTRICT COURT  
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

THE TRUSTEES OF PURDUE	)	
UNIVERSITY,	)	
	)	
Plaintiff,	)	
	)	
v.	)	1:21-cv-840
	)	
WOLFSPEED, INC.,	)	
	)	
Defendant.	)	

**CLAIM CONSTRUCTION MEMORANDUM OPINION AND ORDER**

**OSTEEN, JR., District Judge**

This matter is before this court for claim construction of terms in U.S. Patent No. 7,498,633 ("the '633 Patent"). The parties – Plaintiff, the Trustees of Purdue University, and Defendant Wolfspeed, Inc. – do not dispute the construction of several previously-disputed claim terms, so those terms no longer require construction. (Joint Notice Regarding Dropped Claim Terms (Doc. 124) at 1.) The parties disagree as to the construction of four claim terms in Claims 9 and 10 of the '633 Patent, and they have submitted proposed constructions of those terms. (Ex. A ("Claim Construction Summary") (Doc. 85-1) at 1-12.) Both parties have submitted opening claim construction briefs, (Doc. 103 (Plaintiff); Doc. 104 (Defendant)), as well as responsive briefs, (Doc. 117 (Plaintiff); Doc. 118 (Defendant)). This court held a

claim construction hearing on May 5, 2023, at which time this court took this matter under advisement. (Minute Entry 05/05/2023.) For the reasons set forth herein, this court concludes as follows:

<b>Claim Term</b>	<b>Plaintiff's Construction</b>	<b>Defendant's Construction</b>	<b>Court's Construction</b>
"a first source electrode formed over the first source region" / "a second source electrode formed over the second source region" (Claim 9)	No construction necessary	Claim 9's use of the terms "first" and "second" requires distinct elements (i.e., the "first source electrode" must be distinct from the "second source electrode")	No construction necessary
"a JFET region defined between the first source region and the second source region" (Claim 9)	No construction necessary	Indefinite	No construction necessary
"the JFET region having a width less than about three micrometers" (Claim 9)	No construction necessary	Indefinite	No construction necessary, subject to supplemental briefing
"the JFET region having a width of about one micrometer" (Claim 10, depends from Claim 9)	No construction necessary	Indefinite	No construction necessary, subject to supplemental briefing

## **I. LEGAL STANDARD**

In Markman v. Westview Instruments, Inc., 517 U.S. 370 (1996), the Supreme Court clarified which issues in a patent trial are properly reserved for the jury and which are questions of law to be determined by the court. Specifically, the Court held that interpretation of language in patent claims "is an issue for the judge, not the jury[.]" Id. at 391. The Federal Circuit has provided further guidance on how to interpret patent claims, stating that, in general, courts are to give the words of a claim "their ordinary and customary meaning" as understood by "a person of ordinary skill in the art in question at the time of the invention[.]" Phillips v. AWH Corp., 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc) (citations omitted).

In construing claim terms, courts are directed to consult several specific types of evidence to discern what a person of ordinary skill in the art would understand the term to mean.

Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to "those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean." Those sources include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art."

Id. at 1314 (citations omitted).

First, "the claims themselves provide substantial guidance as to the meaning of particular claim terms." Id. (citation omitted). "To begin with, the context in which a term is used in the asserted claim can be highly instructive." Id. Federal Circuit case law "provide[s] numerous . . . examples in which the use of a term within the claim provides a firm basis for construing the term." Id. (citations omitted).

Other claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term. Because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms. For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.

Id. at 1314-15 (citations omitted). "The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history." Thorner v. Sony Comput. Entm't Am. LLC, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (citation omitted).

The second type of evidence the court should consider is the specification, which "contains a written description of the invention that must enable one of ordinary skill in the art to make and use the invention." See Markman v. Westview Instruments,

Inc., 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 (1996); see also Phillips, 415 F.3d at 1315. "Claims must be read in view of the specification, of which they are a part." Markman, 52 F.3d at 979 (citations omitted). The claims define the invention, but "the specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" Phillips, 415 F.3d at 1315 (citation omitted). "For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims." Markman, 52 F.3d at 979 (citation omitted). "[A] patentee is free to be his own lexicographer[, but] . . . any special definition given to a word must be clearly defined in the specification." Id. at 980 (citations omitted). "[C]laims are not to be interpreted by adding limitations appearing only in the specification. . . . [P]articular embodiments appearing in a specification will not be read into the claims when the claim language is broader than such embodiments." Electro Med. Sys., S.A. v. Cooper Life Scis., Inc., 34 F.3d 1048, 1054 (Fed. Cir. 1994) (citations omitted). A limitation from the specification should only be read into the claims when the specification requires that limitation. See id.

The third type of evidence that a court should consider is the patent's prosecution history. See Phillips, 415 F.3d at 1317; see also Markman, 52 F.3d at 980; Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996). "This 'undisputed public record' of proceedings in the Patent and Trademark Office is of primary significance in understanding the claims." Markman, 52 F.3d at 980 (citation omitted). "The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution. Claims may not be construed one way in order to obtain their allowance and in a different way against accused infringers." Southwall Techs., Inc. v. Cardinal IG Co., 54 F.3d 1570, 1576 (Fed. Cir. 1995) (citations omitted).

There are two relevant exceptions to the general rule that claim terms "are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art[.]" Thorner, 669 F.3d at 1365 (citation omitted).

First, the claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history. Second, a claim term will not carry its ordinary meaning if the intrinsic evidence shows that the patentee distinguished that term from prior art on the basis of a particular embodiment, expressly disclaimed subject matter, or described a particular embodiment as important to the invention.

CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366-67 (Fed. Cir. 2002) (citations omitted); see also Thorner, 669 F.3d at 1365.

The redefinition of a claim term away from its ordinary meaning must be clear "so as to put one reasonably skilled in the art on notice that the patentee intended to so redefine the claim term." Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc., 262 F.3d 1258, 1268 (Fed. Cir. 2001) (citations omitted). However, redefinition need not be explicit. Id. "[T]he specification may define claim terms 'by implication' such that the meaning may be 'found in or ascertained by a reading of the patent documents.'" Id. (citation omitted); see also Trs. of Columbia Univ. v. Symantec Corp., 811 F.3d 1359, 1364 (Fed. Cir. 2016).

"The party seeking to invoke prosecution history disclaimer bears the burden of proving the existence of a 'clear and unmistakable' disclaimer that would have been evident to one skilled in the art." Mass. Inst. of Tech. v. Shire Pharm., Inc., 839 F.3d 1111, 1119 (Fed. Cir. 2016) (citation omitted); see also Omega Eng'g, Inc., v. Raytek Corp., 334 F.3d 1314, 1324 (Fed. Cir. 2003) (stating that a disclaimer occurs "where the patentee has unequivocally disavowed a certain meaning to obtain his patent"). Said disavowal must be clear and may not be "too vague

or ambiguous[.]” Omega Eng’g, 334 F.3d at 1325 (citation omitted).

Evidence from sources other than the claims, the specification, and the prosecution history is extrinsic and generally should be relied upon only when the intrinsic evidence fails to resolve any ambiguity in a disputed term. See Vitronics Corp., 90 F.3d at 1583; see also Phillips, 415 F.3d at 1318-19. Extrinsic evidence includes “expert and inventor testimony, dictionaries, and learned treatises.” Markman, 52 F.3d at 980. A court may use extrinsic evidence to aid its understanding of a patent, but “not for the purpose of varying or contradicting the terms of the claims.” Id. at 981 (citations omitted). Accordingly, the Federal Circuit has stated that “expert testimony, whether it be of an attorney, a technical expert, or the inventor, on the proper construction of a disputed claim term . . . . may only be relied upon if the patent documents, taken as a whole, are insufficient to enable the court to construe disputed claim terms.” Vitronics Corp., 90 F.3d at 1585 (emphasis omitted). In such “rare instances,” prior art documents and dictionaries are preferable to expert testimony because they are objective, reliable, and “accessible to the public in advance of litigation.” Id.



Separate from but related to claim construction is the issue of patent invalidity for indefiniteness. “[I]ndefiniteness is a question of law and in effect part of claim construction.” ePlus, Inc. v. Larson Software, Inc., 700 F.3d 509, 517 (Fed. Cir. 2012). A patent claim is invalid for indefiniteness under 35 U.S.C. § 112 “if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” Nautilus, Inc. v. Biosig Instruments, Inc., 572 U.S. 898, 901 (2014). Like claim construction, determining invalidity is a legal question for the court to evaluate. Young v. Lumenis, Inc., 492 F.3d 1336, 1344 (Fed. Cir. 2007) (“A determination that a patent claim is invalid for failing to meet the definiteness requirement in 35 U.S.C. § 112 . . . is a legal question reviewed de novo.”). “The definiteness requirement must take into account the inherent limitations of language, but at the same time, the patent must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.” Fairfield Indus., Inc. v. Wireless Seismic, Inc., No. 4:14-CV-2972, 2015 WL 1034275, at \*4 (S.D. Tex. Mar. 10, 2015) (citing Nautilus, 572 U.S. at 907-911). “The definiteness requirement ‘mandates clarity, while recognizing that absolute precision is

unattainable.’” Presidio Components, Inc. v. Am. Tech. Ceramics Corp., 875 F.3d 1369, 1375 (Fed. Cir. 2017) (quoting Nautilus, 572 U.S. at 910).

A key difference between claim construction versus the issue of invalidity for indefiniteness relates to burden of proof; in claim construction, there is no burden of proof assigned to either party, whereas with invalidity for indefiniteness, patents are presumed to be valid and the patent challenger has the burden of proving invalidity by clear and convincing evidence. See Microsoft Corp. v. I4I Ltd. P’ship, 564 U.S. 91, 95 (2011); Takeda Pharm. Co. v. Zydus Pharms. USA, Inc., 743 F.3d 1359, 1366 (Fed. Cir. 2014).

## **II. BRIEF OVERVIEW OF THE ‘633 PATENT**

At issue here is the ‘633 Patent, entitled “High-Voltage Power Semiconductor Device.” (‘633 Patent (Doc. 83-1) at 2.)<sup>1</sup> The Patent claims particular double-implanted MOSFETS, which – at a high level – act like electric switches allowing or preventing current to flow from an electrode source to drain. A MOSFET device switches and regulates current in electric circuits by creating static electronic fields in a semiconductor material.

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<sup>1</sup> All citations in this Memorandum Opinion and Order to documents filed with the court refer to the page numbers located at the bottom right-hand corner of the documents as they appear on CM/ECF.

(See Ex. 1, Expert Report of W. Allen Doolittle, Ph.D. Concerning Construction of Certain Terms in U.S. Patent No. 7,498,633 (“Doolittle Report”) (Doc. 104-1) at 13.) A vertical MOSFET device consists of several layers: the gate electrode, gate oxide, source electrodes, a series of semiconductor drift layers of differing polarities, and a lower drain layer. (Id. at 13-14.) Current flows through a channel in the drift layer from the source to the drain. (See id. at 14 n.1.) Applying a static electric field transverse to the current flow creates a “field effect” that impacts the conductance of a semiconductor device. (See id. at 13.)

When a MOSFET device is in the on-state, an electric field forms across the oxide layer of the device and permeates into the semiconductor; this creates a channel in which electrons flow from the source region through the drift layer of the device and into the drain terminal. (Id. at 15.) In the off-state, there is a high resistance in the drift layer that blocks voltage applied to the MOSFET device. (See id. at 15-16.) The JFET region in a MOSFET device is formed from “pinch[ing] [of] current flow from source to drain[,] thus increase[ing] . . . resistance.” (Id. at 17.)

A major “design consideration” in MOSFETS appears to be balancing a “high blocking voltage” with a low “on-resistance of

the semiconductor device" because a decreased on-resistance improves the semiconductor device's efficiency. ('633 Patent (Doc. 83-1) at 7.) "However, the typical fabrication techniques for reducing the specific on-resistance of high-voltage power semiconductor devices may also reduce the blocking voltage of the device." (Id.) As a result, blocking voltage and on-resistance appear to be inversely correlated, where both a high blocking voltage and a low on-resistance are desirable. (See id.) "A JFET region that was too wide would result in the field across the gate oxide in the blocking state to exceed the electric field for oxide breakdown, thus damaging the gate oxide." (Ex. 2, Expert Report of Stanley Shanfield, Ph.D. ("Shanfield Report") (Doc. 103-2) at 17.) "On the other hand, a JFET region that was too narrow would increase the on-state resistance, contrary to the design goal" of the MOSFET device. (Id. at 17-18.)

Plaintiff asserts the '633 Patent, which is directed towards high-voltage metal-oxide semiconductor field-effect transistors with silicon carbide substrates. ('633 Patent (Doc. 83-1) at 1, 8.) The parties dispute four claim terms in Claims 9 and 10 of the '633 Patent, and the parties' positions on those terms are listed below:

<b>Claim Term</b>	<b>Plaintiff's Construction</b>	<b>Defendant's Construction</b>
"a first source electrode formed over the first source region" / "a second source electrode formed over the second source region" (Claim 9)	No construction necessary	Claim 9's use of the terms "first" and "second" requires distinct elements (i.e., the "first source electrode" must be distinct from the "second source electrode")
"a JFET region defined between the first source region and the second source region" (Claim 9)	No construction necessary	Indefinite
"the JFET region having a width less than about three micrometers" (Claim 9)	No construction necessary	Indefinite
"the JFET region having a width of about one micrometer" (Claim 10, depends from Claim 9)	No construction necessary	Indefinite

### III. ANALYSIS

A. "a first source electrode formed over the first source region" / "a second source electrode formed over the second source region"

Claim Term	Plaintiff's Construction	Defendant's Construction
"a first source electrode formed over the first source region" / "a second source electrode formed over the second source region" (Claim 9)	No construction necessary	Claim 9's use of the terms "first" and "second" requires distinct elements (i.e., the "first source electrode" must be distinct from the "second source electrode")

Defendant argues that the use of "first" and "second" specifying the source electrodes and their positions in Claim 9 requires a covered MOSFET device to have two distinct source electrodes, one for each source region. (Def.'s Opening Claim Construction Br. (Doc. 104) at 14-18.) Defendant cites the express language of the claim term, the drawings included in the '633 Patent's specification, and the '633 Patent's prosecution history in support. (See id.) Specifically, Defendant argues that the express language of the claim term uses "first" and "second" as qualifiers for the "source electrodes," such that each source electrode must be a separate and distinct element, not a unitary source electrode for both source regions on the MOSFET device. (Id. at 14-15.) Defendant next contends that the specification

further supports this construction because the figures of the '633 Patent "consistently illustrate the electrodes as separate and distinct" and because the specification discusses each source electrode "respective[]" to each source region." (Id. at 15-16.) Finally, Defendant argues that the prosecution history supports its proposed construction because the terms "first" and "second" were added as amendments during patent prosecution to differentiate the '633 Patent from a prior art, U.S. Patent No. 6,573,534 ("the '534 Patent"), which uses a unitary source electrode. (Id. at 16-18.) At the claim construction hearing, Defendant further refined this argument by contending that while the first and second source electrodes must be separate and distinct elements, they may still be electrically connected.

Plaintiff refutes Defendant's reading of the claim term, arguing that it is inconsistent with the specification. (Pl.'s Opening Claim Construction Br. (Doc. 103) at 28-30.) Plaintiff argues that the claim covers both:

- (1) MOSFETS where there are two unique source electrodes, one formed over the first source region and one formed over the second source region, and
- (2) MOSFETS where there is a single, unitary source electrode that is spatially separated when forming over both the first source region and the second source region.

(Id.) The parties do not dispute that the former MOSFET device with two unique source electrodes is covered by the '633 Patent.

Defendant proposes a construction that narrows the '633 Patent; only the former is covered, and the latter MOSFET device with a unitary source electrode is outside the Patent's scope. In support of its position that no construction is necessary, Plaintiff references the specification, which states that in some embodiments, "the source electrodes 50, 52 are coupled together to form a unitary source electrode." (Id. at 28 (citing '633 Patent (Doc. 83-1) at 10).) Plaintiff argues that this expressly-contemplated embodiment precludes Defendant's proposed narrowing of the claim term. (Id. at 28.) Plaintiff further argues that the patent prosecution history does not support Defendant's proposed construction of the claim term, as an amendment during prosecution does not amount to an unambiguous disavowal of any portion of the scope of the claim, including embodiments explicitly discussed in the specification. (Pl.'s Responsive Claim Construction Br. (Doc. 117) at 15-16.)

"[T]he claims made in the patent are the sole measure of the grant," see Phillips, 415 F.3d at 1312 (quotation omitted), and the claim language explicitly specifies a "first" and a "second" source electrode. "The use of the terms 'first' and 'second' is a common patent-law convention to distinguish between repeated instances of an element or limitation." 3M Innovative Props. Co. v. Avery Dennison Corp., 350 F.3d 1365, 1371 (Fed. Cir. 2003).



However, the cases Defendant cites for this proposition, although constructing terms like "first" and "second," do so in inapposite contexts. For example, in 3M Innovative Properties, the Federal Circuit held that numerical terms like "first" and "second" in a claim term did not impose a serial or sequential order limitation in the claim. Id. And the court in Gillette Co. v. Energizer Holdings, Inc. held that numerical terms did not limit the number of blades on a claim in the invention. 405 F.3d 1367, 1372 (Fed. Cir. 2005). The types of patented subject matter in both cases Defendant cites are dissimilar to the present case, and those cases do not even consider the issue here – whether numerical terms like "first" or "second" may cover a single element serving dual roles in the claim.

In contrast, Plaintiff cites to Koninklijke Philips N.V. v. Wangs All. Corp., which rejected the defendant's argument that a "second LED" required a "separate and distinct" light emitting diode that was not physically and electronically connected to the "first LED." No. CV 14-12298-DJC, 2017 WL 6329616, at \*11-12 (D. Mass. Dec. 11, 2017). Like the present case, Koninklijke Philips N.V. pertains to a patent for a semiconductor device, albeit a different type of semiconductor. Id. at \*1. Additionally, the construction of "second" in Koninklijke Philips N.V. implicates similar issues as the present case – whether use of language like

"first" and "second" requires two distinct electricity sources, or whether a single source that connects to two regions on an electrode is also covered by the claim language. Id. at \*11-12. Koninklijke Philips N.V. rejected the defendant's proposed narrowing of the claim scope and concluded that no construction was necessary, explaining that the court would "not reinterpret the claim language where it is sufficiently clear and where the specification discloses embodiments electronically and physically grouped together." Id. at \*12.

In light of the specification, the terms "first" and "second" in the '633 Patent do not require the first and second electrodes to be electrically or physically disconnected, as Defendant contends. The specification explicitly considers and includes the possibility of a single source electrode. In its description of Figure 1, the specification states:

A source metallic electrode 50, 52 is formed over the source regions 46, 48 respectively. In some embodiments, the source electrodes 50, 52 are coupled together to form a unitary source electrode.

. . .

The semiconductor device 10 may be electrically coupled with other electrical devices, sources, or the like via the electrodes. . . .

('633 Patent (Doc. 83-1) at 10 (emphasis added).) Even though "the claims made in the patent are the sole measure of the grant," a claim term "can be defined only in a way that comports

with the instrument as a whole.” Phillips, 415 F.3d at 1312. Further, “a claim interpretation that excludes a preferred embodiment from the scope of the claim is rarely, if ever, correct.” On-Line Techs., Inc. v. Bodenseewerk Perkin-Elmer GmbH, 386 F.3d 1133, 1138 (Fed. Cir. 2004) (internal citation and quotations omitted).

The parties do not dispute that embodiments where the source electrodes are distinct and decoupled are covered within the scope of the ‘633 Patent. (Compare Pl.’s Opening Claim Construction Br. (Doc. 103) at 28-30, with Def.’s Opening Claim Construction Br. (Doc. 104) at 14-18.) The specification explicitly considers and chooses to include embodiments where a single electrode is used for both the “first” and the “second” source regions. (‘633 Patent (Doc. 83-1) at 10.) Defendant’s proposed construction would narrow the claim to exclude an expressly-included embodiment. The claim language, in light of the specification, is “sufficiently clear” and contemplates MOSFETs with a single unitary source electrode formed over the “first” and “second” source regions.

Defendant references the ‘633 Patent’s prosecution history to argue that the March 12, 2008 amendment to Claim 9 – which added the “first” and “second” language at issue to Claim 9 – shows that the claim was amended to require a distinct “first

source electrode" and "second source electrode" to distinguish the '633 Patent from a prior art with a single unitary source electrode. (Def.'s Opening Claim Construction Br. (Doc. 104) at 16-17, see also Ex. C (Doc. 104-3) at 42.) However, the amendment alone does not demonstrate that its purpose was to distinguish from a prior art that included a single source electrode, particularly as the remarks to that amendment show that the amendment was also in response to the Patent Examiner's proposed combination of three different prior art references. (See Ex. C (Doc. 104-3) at 10-11, 47-48.) Finding disclaimer of claim scope based on prosecution history requires "a clear and unmistakable disavowal of scope during prosecution." Purdue Pharma L.P. v. Endo Pharm. Inc., 438 F.3d 1123, 1136 (Fed. Cir. 2006). Ambiguous statements in prosecution history are not enough to support limiting claim scope, particularly when the applicant's statements may be subject to multiple interpretations. SanDisk Corp. v. Memorex Prods., Inc., 415 F.3d 1278, 1287 (Fed. Cir. 2005) ("There is no 'clear and unmistakable' disclaimer if a prosecution argument is subject to more than one reasonable interpretation, one of which is consistent with a proffered meaning of the disputed term."). The amendment alone, given the specification's inclusion of an embodiment with a unitary source electrode, is not a "clear and

unmistakable disavowal of scope.” See Purdue Pharma L.P., 438 F.3d at 1136.

In sum, reading the “instrument as a whole,” see Phillips, 415 F.3d at 1316, this court concludes that no construction is necessary for the term “a first source electrode formed over the first source region” and “a second source electrode formed over the second source region.”

Defendant also raises the issue that the ‘534 Patent already covers a MOSFET with a unitary source electrode. (Def.’s Opening Claim Construction Br. (Doc. 104) at 16-18.) Plaintiff’s proposed construction of the ‘633 Patent, which this court adopts, explicitly contemplates a unitary source electrode. Defendant argues that during prosecution of the ‘633 Patent, Plaintiff amended the claim at issue to specifically distinguish from the ‘534 Patent’s use of a unitary source electrode. (Id.) However, invalidity due to anticipation by a prior art reference is a factual question for summary judgment or trial. See Oney v. Ratliff, 182 F.3d 893, 895 (Fed. Cir. 1999) (“Although anticipation is a question of fact, it still may be decided on summary judgment if the record reveals no genuine dispute of material fact.”). This court need not reach this issue during claim construction.

**B.     "a JFET region defined between the first source region  
and the second source region"**

<b>Claim Term</b>	<b>Plaintiff's Construction</b>	<b>Defendant's Construction</b>
"a JFET region defined between the first source region and the second source region" (Claim 9)	No construction necessary	Indefinite

Defendant argues that the claim term – "a JFET region defined between the first source region and the second source region" – is indefinite because of an alleged inconsistency between the term's plain language (which requires the JFET region to be bordered by the first and second source regions), and the specification (which defines the JFET region as bound by the two p-wells). (Def.'s Opening Claim Construction Br. (Doc. 104) at 19-20.) Relying on testimony from its expert, Dr. Doolittle, Defendant argues that this inconsistency between the claim term and the specification means that the width of the JFET region will vary depending on the boundaries from which it is measured. (Id. at 20-21.) Dr. Doolittle explains that the explicit claim language "results in the JFET region including a portion of the first and second p-well regions 26 and 28." (Doolittle Report (Doc. 104-1) at 26.) However, he opines that "the specification and figures of the '633 Patent describe the JFET region as

distinct from and defined between the p well regions of the device.” (Id.)

Defendant contends that this inconsistency is meaningful because the “variability could mean that a given MOSFET device falls within or outside the scope of the claims depending on where it is measured,” either “between the source regions or p-wells.” (Def.’s Opening Claim Construction Br. (Doc. 104) at 21.) Dr. Doolittle proffers an example, in which a MOSFET device falls outside the scope of the ‘633 Patent when the JFET region is defined between and measured between the source regions (as stated in the claim language), while that MOSFET device falls within the scope of the ‘633 Patent when the JFET region is defined between and measured between the p-wells (as described in the specification). (Doolittle Report (Doc. 104-1) at 28-29.) According to Defendant, this inconsistency raises a “zone of uncertainty” rendering the claim term indefinite, as the claim term “is open to multiple interpretations reflecting markedly different understandings of the patent’s scope.” (Def.’s Opening Claim Construction Br. (Doc. 104) at 22 (quoting Nautilus, 572 U.S. at 909, 913).)

Defendant also argues that, regardless of whether the JFET region is defined between the source regions or the p-wells, the ‘633 Patent fails to specify where the JFET region’s width is

measured, which varies due to the curvature of the p-well boundaries. (Id. at 23-24.) Again, Defendant contends that a given MOSFET device may fall within or outside the scope of the '633 Patent depending on where the JFET region's width is measured, creating an ambiguity rendering the claim term indefinite. (Id. at 24, 26.)

Plaintiff argues that Defendant's contention of indefiniteness is pretextual because Defendant understood the location of the JFET region during inter partes review of the '633 Patent.<sup>2</sup> (Pl.'s Opening Claim Construction Br. (Doc. 103) at 15-16.) Additionally, Plaintiff argues that the claim term is not indefinite in light of the specification; instead, Plaintiff

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<sup>2</sup> Plaintiff's argument concerning Defendant's position during inter partes review of the '633 Patent is not convincing. The standard of review in an IPR proceeding is different from that in district court litigation. In an IPR proceeding, the burden of proving a claim invalid is preponderance of the evidence. 35 U.S.C. § 316(e). However, when evaluating a claim as invalid for indefiniteness, the patent challenger must prove a claim invalid by clear and convincing evidence. Microsoft Corp., 564 U.S. at 95; Takeda Pharm. Co., 743 F.3d at 1366. Further, "[t]he statutory provisions governing the inter partes review process do not permit the Board to institute inter partes review of claims for indefiniteness. . . . [T]he petitioner in the IPR proceeding below [is] thus not permitted to request that the Board cancel claims . . . on the ground that they were indefinite. Nor [can] the Board cancel those claims as indefinite on its own accord." Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp., 948 F.3d 1342, 1350-51 (Fed. Cir. 2020). Thus, whether or not Defendant raised particular issues before the Patent Trial and Appeal Board does not limit Defendant's arguments concerning indefiniteness before this court.



suggests Defendant's expert narrows in on the claim term without context of the specification to argue that the term is indefinite. (Id. at 18-20.) More specifically, Plaintiff argues that "the specification informs the claims by stating that the JFET region is between the p well regions, thereby pointing to exactly where the JFET region should be measured in the space between the first source region and the second source region." (Pl.'s Responsive Claim Construction Br. (Doc. 117) at 7.) In short, Plaintiff argues that the claim and specification are consistent because "the JFET region is located between the p wells, which also falls between the first source region and the second source region." (Id.)

Plaintiff also refutes Defendant's argument concerning a lack of guidance on where the JFET region's width should be measured, explaining that "the JFET region should be measured at the narrowest point to achieve the intended design." (Id. at 9.) This is because Plaintiff contends a person of skill in the art would know there is an optimum width that furthers the MOSFET device's design goal of "achiev[ing] the lowest possible on-resistance while meeting the desired blocking voltage specification." (Id. (quoting Shanfield Report (Doc. 103-2) at 17-18).)

This court finds that there is no inconsistency between the claim term and the specification rendering the claim term indefinite. However, this court, in a separate order, will request supplemental briefing on the discrete argument Defendant raises concerning where the JFET region's width is measured.

Addressing Defendant's argument concerning a purported inconsistency between the claim term and the specification, this court starts with intrinsic evidence, as "it is improper to rely on extrinsic evidence" when intrinsic evidence alone will resolve any ambiguity. See Vitronics Corp., 90 F.3d at 1583. Considering the claim term itself and the ordinary meaning that would be attributed to the term by a person skilled in the relevant art, "defined between" is a clear term that, by its plain language, delineates or establishes the outer boundaries of the "JFET region." "There is a heavy presumption that claim terms are to be given their ordinary and customary meaning." Aventis Pharm. Inc. v. Amino Chems. Ltd., 715 F.3d 1363, 1373 (Fed. Cir. 2013).

"Defined between" is used so ubiquitously in patent specifications that this court has not found any caselaw providing a precise and unambiguous definition of "defined" or "defined between." Even so, it is commonly used as a term to delineate boundaries. See, e.g., Ascion, LLC v. Ashley Furniture Indus., Inc., No. 2021-1857, 2022 WL 1197338, at \*1 (Fed. Cir.

Apr. 22, 2022) (“body portion having a first top-to-bottom length defined between the top edge and bottom surface”) (emphasis added); Campbell Soup Co. v. Gamon Plus, Inc., No. 2020-2322, 2021 WL 3671366, at \*1 (Fed. Cir. Aug. 19, 2021) (“The chutes 22, 24 are defined between adjacent pairs of panels 10 and are of a width slightly greater than the width of products 90 [(e.g., soup cans)] and which allow the products to be stored and dispensed therefrom.”) (emphasis added); In re Smolak, 88 F.2d 838, 839 (C.C.P.A. 1937) (“intermediate portions of irregularly sloping surfaces defined between the said elevated and depressed portions”) (emphasis added). Accordingly, the claim term “defined between” establishes the absolute boundaries of the “JFET region” as the “first source region” and the “second source region.”

However, the claim term must also be considered in light of the entire '633 Patent, including the specification and drawings. Cf. Funai Elec. Co. v. Daewoo Elecs. Corp., 616 F.3d 1357, 1371 (Fed. Cir. 2010) (“We affirm the district court’s claim construction, for it is in accordance with the specification including the drawings . . . .”). In Figure 1, the JFET region 30 is bounded on the left by p-well 26 and on the right by p-well 28. ('633 Patent (Doc. 83-1) at 3.) In alignment with the claim term, in Figure 1, the JFET region 30 is also between the first source region on the left and the second source region on the

right. (Id.) Further, Claim 9 provides a range for the JFET region's possible width, and Dr. Shanfield explains that the JFET region's width may vary to optimize for "the lowest possible on-resistance while meeting the desired blocking voltage specification." (Shanfield Report (Doc. 103-2) at 17.) As a result, the JFET region must fall between the p-wells, as well as the first and second source regions; even if the JFET region is precisely bounded by the first and second source regions, it still falls within the p-wells. Figure 1's description in the specification supports this construction of the claim term:

As illustrated in FIG. 1, the semiconductor device 10 also includes source regions 46, 48 defined in the "P" wells 26, 28, respectively.

('633 Patent (Doc. 83-1) at 9 (emphasis added).) By the claim specification, the first and second source regions are "in" the p-wells, or at least overlap in location with the p-wells. (Id.) Thus, although the claim term is arguably less precise than the specification, the two are not inconsistent such that a person skilled in the relevant art or the public would be unable to understand the scope of the claim. The claim term, specification, and Figure 1 taken together demonstrate the JFET region falls between both the source regions and the p-wells, particularly since the specification defines the source regions as "in" the p-wells themselves. (See id. at 9.)

In support of its argument for indefiniteness, Defendant cites to Allen Eng'g Corp. v. Bartell Indus., Inc., 299 F.3d 1336 (Fed. Cir. 2002) and Juxtacomm-Texas Software, LLC v. Axway, Inc., No. 6:10CV011, 2012 WL 7637197 (E.D. Tex. July 5, 2012), aff'd sub nom. JuxtaComm-Texas Software, LLC v. TIBCO Software, Inc., 532 F. App'x 911 (Fed. Cir. 2013). (Def.'s Responsive Claim Construction Br. (Doc. 118) at 11-12.) However, the alleged inconsistency here is not like Allen Eng'g Corp., in which the plaintiff unsuccessfully tried to claim a person skilled in the relevant art would read "perpendicular" to mean "parallel." 299 F.3d at 1349. A lack of specificity in the claim term, when the specification provides that further detail, like here, is not akin to claiming the opposite meaning of a word. Juxtacomm-Texas Software is also not a meaningful comparison. In Juxtacomm-Texas Software, the claims at issue stated that "data transformation must occur within the systems interface," whereas the patent specification explained that the "systems interface merely defines the scripts that perform data transformation." 2012 WL 7637197, at \*5-6. Whether an interface performs a particular task outright or whether it writes a script that performs a task are two different pieces of software. The issue in the present case appears to be lack of precision, not a contradiction between the claim and specification.

Accordingly, considering both the language of the claim and the specification together, a person skilled in the relevant art is informed “with reasonable certainty” of “the scope of the” claim term “a JFET region defined between the first source region and the second source region,” so it is not indefinite on those grounds. See Nautilus, 572 U.S. at 901.

**C.     “the JFET region having a width less than about three micrometers” and “the JFET region having a width of about one micrometer”**

<b>Claim Term</b>	<b>Plaintiff’s Construction</b>	<b>Defendant’s Construction</b>
“the JFET region having a width less than about three micrometers” (Claim 9)	No construction necessary	Indefinite
“the JFET region having a width of about one micrometer” (Claim 10, depends from Claim 9)	No construction necessary	Indefinite

Defendant argues that both of these claim terms are indefinite because the ‘633 Patent does not provide objective boundaries for the JFET region’s width. (Def.’s Opening Claim Construction Br. (Doc. 104) at 22-27.) Specifically, Defendant argues that the claim term – “the JFET region having a width less than about three micrometers” – is indefinite because the claim term does not provide an upper or lower bound for the JFET

region's width and because of the use of the word "about." (Id. at 27-33.) And Defendant argues that the claim term – "the JFET region having a width of about one micrometer" – is indefinite for the same reasons. (Id. at 33.) Defendant also appears to restate this argument in other words in its responsive brief by arguing that "[t]he patent fails to specify an objective upper boundary." (Def.'s Responsive Claim Construction Br. (Doc. 118) at 15 (cleaned up).)

Plaintiff argues that Defendant's argument about a lack of objective bounds lacks merit because a person skilled in the relevant art would know not to create a MOSFET with a JFET region width of zero that renders the MOSFET inoperable. (Pl.'s Opening Claim Construction Br. (Doc. 103) at 22-25.) Additionally, Plaintiff argues that the word "about" is not indefinite given inevitable variations in manufacturing processes. (Id. at 25-28.)

First, the use of the term "about" does not render either claim term indefinite. "About" has an "ordinary meaning of 'approximately.'" Merck & Co. v. Teva Pharms. USA, Inc., 395 F.3d 1364, 1369 (Fed. Cir. 2005). And neither the claims, nor the specification, suggest the patentee has redefined the term "about" away from its ordinary meaning. See id. at 1370. Thus, the claim term "the JFET region having a width less than about three micrometers" can be construed as meaning "the JFET region

having a width less than approximately three micrometers." The claim term "the JFET region having a width of about one micrometer" can be construed as meaning "the JFET region having a width of approximately one micrometer."

In this context, "'about' is properly described as a 'word of degree' or 'term of degree.'" See Enviro Tech Chem. Servs., Inc. v. Safe Foods Corp., No. 4:21-CV-00601-LPR, 2022 WL 17721179, at \*13 (E.D. Ark. Dec. 15, 2022). "Other courts have found claim terms of approximation such as 'about' to have sufficiently definite meaning on the basis of manufacturing tolerances and/or rounding." Glaukos Corp. v. Ivantis, Inc., No. SACV 18-620 JVS (JDEX), 2019 WL 8955768, at \*11 (C.D. Cal. Aug. 16, 2019) (collecting cases). Even so, terms of degree must be sufficiently definite. Berkheimer v. HP Inc., 881 F.3d 1360, 1364 (Fed. Cir. 2018) ("Our case law is clear that the objective boundaries requirement applies to terms of degree.").

The '633 Patent uses the term "about" as a "term of degree" to account for such manufacturing tolerances or variations, and "about" is sufficiently definite as used in the '633 Patent. Dr. Shanfield explains on behalf of Plaintiff that fabrication of MOSFET devices "necessarily results in minor variations in feature dimensions because of the equipment used and the microscopic feature sizes." (Shanfield Report (Doc. 103-2) at



16.) He explains that "while the average measurements of a device will be close to the specified value across the thousands of dice on a semiconductor device, any two devices made using the same fabrication process will have some minor deviation from this average." (Id. at 16-17.) The manufacturing variations that impact the width of the JFET region depend on several factors, including transverse straggle and critical dimension tolerance. (Id. at 17.) A person skilled in the art would understand that the width of the JFET region depends upon a careful balance between "the lowest possible on-resistance while meeting the desired blocking voltage specification." (Id.) A person skilled in the art would also be informed about the JFET region's width by existing design criteria and by published literature. (Id. at 18.) Accordingly, a person skilled in the relevant art would know that while the JFET width can be specified precisely during the design phase, "the JFET width after fabrication cannot be specified to exact values," only "a distribution with range and standard deviation." (Id. at 17.)

Dr. Doolittle acknowledges the possibility of manufacturing variation, but he argues that "there is no universal or accepted degree of variation that is considered acceptable in the field of MOSFET design." (Doolittle Report (Doc. 104-1) at 43.) Specifically, he explains that "the degree of acceptable

variation depends on design goals [and] constraints,” but “the ‘633 Patent fails to specify any of those parameters that would help a person of ordinary skill in the art understand the acceptable degree of variation.” (Id. at 44.)

Using a term of degree, which permeates patent claims, is not enough to render the claim term indefinite. Defendant demands the claim include a numerical range of error to clarify the meaning of “about,” but the Federal Circuit frequently refuses to impose a more exact or numerically precise construction on terms of degree. See, e.g., Anchor Wall Sys. v. Rockwood Retaining Walls, Inc., 340 F.3d 1298, 1310-11 (Fed. Cir. 2003) (“[T]he phrase ‘generally parallel’ envisions some amount of deviation from exactly parallel,” and “words of approximation, such as ‘generally’ and ‘substantially,’ are descriptive terms commonly used in patent claims to avoid a strict numerical boundary to the specified parameter.”). Dr. Shanfield’s explanation that a person skilled in the art would know to optimize “achiev[ing] the lowest possible on-resistance while meeting the desired blocking voltage specification,” (Shanfield Report (Doc. 103-2) at 17), when designing a MOSFET device is akin to defining the patent term in “functional terms, thereby saving it from indefiniteness.” See Automated Packaging Sys., Inc. v. Free Flow Packaging Int’l, Inc., No. 18-CV-00356-EMC, 2018 WL 3659014, at \*17 (N.D. Cal.

Aug. 2, 2018) (explaining that the term “substantial” is a “term of degree” that is rendered sufficiently definite because the patent specification provides a functional purpose for the term).

In Automated Packaging Sys., the term “substantially” was found sufficiently definite when used in the phrase, “longitudinally spaced transverse lines . . . extending substantially from the side edge to the fill edge,” even though the patent claims and specification did not define “substantially extend.” Id. at \*15-16. This is because the court found the claim language to be “defined in functional terms,” where the “function of the transverse lines . . . is to permit facile separation of the pouches.” Id. at \*17. The range of the transverse lines’ possible lengths was finite, and a person skilled in the art could test to determine what length allowed “facile separation of the pouches,” depending on “the tensile strength and thickness of the web material.” Id.

In Biosig Instruments, the Federal Circuit also found terms of degree to be sufficiently definite when the terms depended on the function of the claimed material. 783 F.3d at 1382-84. The Federal Circuit held that a “spaced relationship” between electrodes in a heart rate monitor was a sufficiently definite term with proper bounds because the patent provided objective standards that a person skilled in the art could test to ensure

the electrodes satisfied their function within the patent. Id. For example, one objective standard included testing for the “substantial removal of EMG signals from ECG signals.” Id. at 1384 (quoting Biosig Instruments, Inc. v. Nautilus, Inc., 715 F.3d 891, 900-01 (Fed. Cir. 2013), vacated, 572 U.S. 898 (2014)).

Here too, “about” is sufficiently definite because the ‘633 Patent informs a person skilled in the art of the JFET width’s function, which is to optimize between a lower on-resistance and desired blocking voltage. (Shanfield Report (Doc. 103-2) at 17.) A person skilled in the art could test the on-resistance and blocking voltage to ensure the two are optimized to serve the purpose of the MOSFET device, like how a person skilled in the art could test for removal of EMG signals from ECG signals in Biosig Instruments. See 783 F.3d at 1384. Accordingly, “about” is a sufficiently definite term of degree in the claim term and does not render the claim terms indefinite.

Relatedly, the lack of an upper bound does not render the claim term “the JFET region having a width less than about three micrometers” – indefinite. The claim term explicitly provides an upper boundary of “three micrometers,” and the use of “about” accounts for manufacturing variation during fabrication even when the JFET width is “specified to exact values” during the “design phase.” (See Shanfield Report (Doc. 103-2) at 17.)

Second, the lack of a lower bound does not render the claim term – “the JFET region having a width less than about three micrometers” – indefinite. While Defendant agrees that a width of zero is “outside the scope of the claim because . . . [it] would render the MOSFET device inoperable,” Defendant poses “the question [of] what the minimum allowable width is.” (Def.’s Opening Claim Construction Br. (Doc. 104) at 27.) However, when the claim does not contain a lower bound, the claim “expressly reach[es]” all operable devices with a “JFET region having a width less than about three micrometers.” See Exxon Rsch. & Eng’g Co. v. United States, 265 F.3d 1371, 1382 (Fed. Cir. 2001) (explaining that a claim that did not include an upper limit on particle diameter “expressly reach[ed]” all such particles with a diameter greater than the stated minimum, and that “no limitation [was] required as a matter of definiteness”). Failure to include a size bound does not render a patent indefinite, as a person skilled in the relevant art would know to create an operable MOSFET under the guideline of a JFET region with a width less than “about three micrometers.” Plaintiff agrees that “any operable device with a JFET width less than about three micrometers meets the claim limitation.” (Pl.’s Responsive Claim Construction Br. (Doc. 117) at 11.) Defendant’s expert, Dr. Doolittle, makes the same point. (Doolittle Report

(Doc. 104-1) at 42 (“The patent does not limit the JFET width to a minimum of one micron or disclaim values between zero and one.”).) This is particularly true when a shorter JFET region width is desirable for reducing the on-resistance of the MOSFET, thereby increasing its efficiency. A person skilled in the relevant art is informed, “with reasonable certainty,” of “the scope of the invention,” so the lack of a lower bound does not render the claim term indefinite. See Nautilus, 572 U.S. at 901.

Although merely persuasive to this court, the Western District of Texas, when also construing “about three micrometers” in the ‘633 Patent for indefiniteness, reached the same conclusion. See Claim Construction Order and Memorandum in Support Thereof at 30, Trustees of Purdue Univ. v. STMicroelectronics Int’l N.V., No. 6:21-cv-727-ADA-DTG (W.D. Tex. Dec. 14, 2022), Doc. 220.<sup>3</sup>

Third, the claim term – “the JFET region having a width of about one micrometer” – is not indefinite due to the use of the word “about” or due to the lack of a “range of acceptable widths above and below one micron.” (Def.’s Opening Claim Construction

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<sup>3</sup> The parties in the Western District of Texas litigation did not raise the issue of whether the ‘633 Patent specifies where the JFET region’s width is measured. Accordingly, this court does not find the Western District of Texas’s construction of the term, “about three micrometers,” persuasive to the degree that term may be rendered indefinite based on Defendant’s concern about where the JFET region’s width is measured.

Br. (Doc. 104) at 33.) As explained previously, the use of terms of degree like "about" do not render a claim indefinite. A width of "about" or "approximately" one micrometer appears straightforward on its face, requiring no narrowing of the claim scope. See, e.g., Home Diagnostics, Inc. v. LifeScan, Inc., 381 F.3d 1352, 1358 (Fed. Cir. 2004) ("Absent a clear disavowal or contrary definition in the specification or the prosecution history, the patentee is entitled to the full scope of its claim language."). This claim term is in Claim 10, which is dependent on Claim 9. As such, reading Claim 10 in context of Claim 9, even if an upper bound is necessary, a person skilled in the relevant art would understand there to be an upper bound to the JFET region's width of "about three micrometers." Accordingly, this claim term informs a person skilled in the relevant art "with reasonable certainty" of "the scope of the invention," so it is not indefinite. See Nautilus, 572 U.S. at 901.

In sum, this court finds that neither of those two claim terms are indefinite based on the arguments presented and that no construction is necessary. However, as will be addressed in a separate order, this court is concerned that Defendant's argument about the '633 Patent's lack of guidance on where the JFET region's width is measured may impact this court's conclusions

concerning the term "width" within the two claim terms at issue here.


#### IV. CONCLUSION

For the foregoing reasons, this court construes the disputed terms as follows:

Claim Term	Court's Construction
"a first source electrode formed over the first source region" / "a second source electrode formed over the second source region" (Claim 9)	No construction necessary
"a JFET region defined between the first source region and the second source region" (Claim 9)	No construction necessary
"the JFET region having a width less than about three micrometers" (Claim 9)	No construction necessary, subject to supplemental briefing
"the JFET region having a width of about one micrometer" (Claim 10, depends from Claim 9)	No construction necessary, subject to supplemental briefing

**IT IS SO ORDERED.**

This the 7th day of August, 2023.

  
United States District Judge